

T17D04 – (17.1) Liquid-Vapor Equilibrium Notes

Name

Describe how a refrigerator works, provide a diagram if necessary:

1. 17.1.1 Describe the equilibrium established between a liquid and its own vapor and how it is affected by temperature changes. (2)

- a. Provide a diagram for the movement of gas and liquid particles across the interface (phase boundary) when evaporation, condensation, and equilibrium occurs:

Evaporation	Condensation	Equilibrium

- b. How can the vapor pressure of a liquid be measured?

- c. What is saturated vapor pressure?

- d. Explain why it's important for the vapor pressure of Hg (mercury) to be so much less than that of liquids to be tested:

- e. Provide a diagram of vapor pressure over time that depicts what happens when a liquid is introduced to a closed container:

- f. What are the properties of liquids of the following rate of evaporation:

Very slow Evaporation	Rapid Evaporation

2. 17.1.2 Sketch graphs showing the relationship between vapor pressure and temperature and explain them in terms of the kinetic theory. (3)

- a. Using a diagram, show the difference in force applied to molecules of water at the surface and in the body of a liquid:

- b. With increasing temperature, the molecules in a warm liquid (on average) have more kinetic energy. Give two reasons and provide an Maxwell-Boltzmann distribution for a liquid at two temperatures:

i. Reason 1:

ii. Reason 2:

iii. Maxwell-Boltzmann Distribution

- c. What is a boiling point, and when does it occur?
- d. Provide a vapor pressure vs temperature diagram. Also label and explain why water boils at a lower temperature in high altitudes:

3. 17.1.3 State and explain the relationship between enthalpy of vaporization, boiling point and intermolecular forces. (3)
- a. What happens when a volatile liquid is placed in the palm of your hand? Also mention what happens to the bonds and intermolecular forces present in the system

- b. Define the enthalpy of vaporization (ΔH_{vap})

- c. Describe the properties of liquids with the following enthalpy of vaporization:

Low enthalpy of vaporization	High enthalpy of vaporization

- d. Briefly describe each of the following intermolecular forces:
- van der Waals' forces
 - dipole-dipole interactions
 - hydrogen bonding
- e. What is the strongest intermolecular force present in each of the following compounds? Give the molecular formula and use it to explain:
- Ethanal
 - Ethanol
 - 2-methylpropane
 - Methoxymethane
 - Put i,ii,iii in order of increasing boiling point based on your answers above:
- f. How is the boiling point vs enthalpy of vaporization correlated:

- g. What is a phase?

- h. What is a colloid or dispersed phase?

- i. In a phase diagram for a typical substance and for water, label the triple point, solid, liquid, and gas phases.

Phase diagram for a typical substance	Phase diagram for water

